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ECTIONS FROM THE RECORDS OF THE BOMBAY GOVERNMENT.

No. XX.—New Series.

MEMORANDUM

ON THE

WATER OF NULLAS IN JUNGLE DISTRICTS,

AS PRODUCTIVE OF DISEASE;

AND THE

NECESSITY OF PROVIDING WELLS AS THE INDISPENSABLE PRELIMINARY TO THE MATERIAL IMPROVEMENT OF SUCH DISTRICTS.

By A. BETTINGTON, C. S.:

WITH THE

OPINIONS

OF THE

MEDICAL BOARD, THE CONSERVATOR OF FORESTS, THE TWO REVENUE COMMISSIONERS,

AND THE

SEVERAL COLLECTORS;

AND

THE RESOLUTION OF GOVERNMENT PASSED THEREON.

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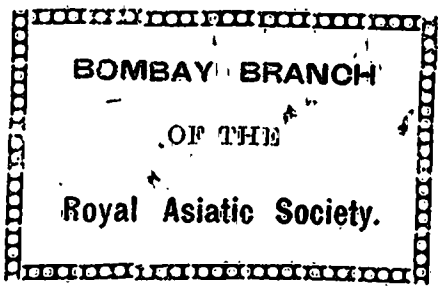

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MEMORANDUM

ON THE

WATER OF NULLAS IN JUNGLE DISTRICTS,

AS PRODUCTIVE OF DISEASE; AND THE NECESSITY OF PROVIDING WELLS AS THE INDISPENSABLE PRELIMINARY TO THE IMPROVEMENT OF SUCH DISTRICTS.

By A. BETTINGTON, C. S.

In my Revenue Reports for 1838-39 I adverted to the subject of the Water in Jungle Districts as the chief cause of the fevers which prevail in those districts.

I had then had charge for some years of the Kitoor and other Jungle Talookas in the Southern Mahratta Country.

I have since had many opportunities of observation in the jungles at the foot of the Neilgherry Mountains, in Guzerat, Ceylon, and other countries, all tending to confirm the opinion *that the health of the population of jungle districts is more affected by the bad water which they drink throughout the year, than by the malaria, which, however deadly, is only in operation for a very limited period.*

The Government sanctioned a proposition I made at that time, and several wells were dug in Kukery, one of the most unhealthy of the said jungle districts. Soon after, I was obliged by sickness to leave the Southern Mahratta Country, or I should have extended these operations, being confident the result would have been satisfactory to Government.

The people of the districts referred to have no supply of water, except from the nullas. The leaves of trees, many of them (pronounced by botanists to be) poisonous, are carried down by the periodical rains, and left in the deeper pools. This water, bad at all times, is especially so in the hot months, when the pools are isolated, the water stagnant, and (as explained above) full of decomposed vegetable matter.

This applies more or less to all jungle districts *(and tanks fed by jungle streams require gratings and filtering* apparatus, or they are subject to the same influences)* in all the forest country from Western Khandeish, Canara,

* In the Report on the proposed Lake at Vehar, provision, I think, is made for filtering.

Bala Ghaut, and the Mysore to the Wynaud Forest. It is notorious that the water produces fever and affections of the spleen. The Natives are well aware of it; so are all Europeans, who, whether for business or field sports, or both, have been much in the jungle.

To those who reside always in these little-favoured districts, constant sickness and premature old age are the infallible consequences;—enlarged spleen and wasted limbs are sure and fearful evidences of the disease which carries them to the grave.

The subject is one that merits attention; and if it can be shown to the satisfaction of Government that means can be found to improve the climate of jungle districts (including a vast tract of the Bombay and Madras Presidencies), to the great benefit of the people,—and, as a necessary consequence, a great improvement in the revenue, and general condition of those districts,—I doubt not they will be adopted after due inquiry to test the soundness of the opinions here put forward; and I would suggest that the Conservator of Forests, and other officers who have been much in the jungle, should be requested to confirm or refute what I have alleged, viz.—That it is a positive fact (in many instances within my own personal knowledge), that wherever in a jungle district a well has been dug, affording a supply of good spring-water, there has been a remarkable improvement in the health of the people.

A reference to the Collector of Belgaum would show the number of wells dug by my orders at Kukery and elsewhere, at the period above referred to, under the orders of Government, and the result.

I have no official document to refer to, but I can state from memory some cases in point:—

Jambotee, a large village, notoriously unhealthy. The Desaee constructed a well: the inhabitants became healthy, and continued so.

At Tullywaree no one appeared to escape the fever. A well was built there by my order: the fever disappeared. It is now about fourteen years ago; there has been no return of endemic fever.

At Hemergah, six miles distant, there is no well: to drink the water for one week invariably produces fever.

At Teerutkoonder, the tank-water produces fever; the water of a spring at the same village is wholesome, and those who drink from it are exempt.

Chandghur is very healthy. Other villages, north and south, having the same relative bearing to the jungle and the Ghauts, are subject to fever.

Chandghur has good water.

It would be useless to multiply instances,—the same principle applies to all the forests of the Sahyadrees as well as to the great forest in Ceylon: there also certain villages are more unhealthy than others, and this is universally attributed, and I believe with justice, to bad water.

There is no novelty in the point I have here advanced:—

Ubi bonæ sunt aquæ, ibi bonus.
Ubi malæ, malus itidem est aer.

The question appears to be whether the remedy I suggest is sufficient and effectual.

I doubt not some difference of opinion will be found to prevail as to how much of disease is to be assigned to bad water, and how much to malaria.

I am prepared to admit that there are certain localities which can never be made healthy; but I view these as exceptional cases, and believe that many of our jungle districts can be rendered *comparatively free from fever,* and to the inhabitants absolutely healthy, simply by the construction of wells, and supplying them with spring-water; and that when these districts are brought *properly under cultivation,* there will be a *still further amelioration in the climate,* and, by consequence, the general condition of such districts.

The western districts of Dharwar, Belgaum, Kolapore, Sattara, Poona, Nuggur, and Khandeish, are all improvable in this manner.

I would propose that certain villages should be selected, where the water is decidedly bad, the soil in the neighbourhood good, so as to afford reasonable prospect of return hereafter (the Kukery Keriat,* for example), and let wells be there constructed, at certain selected sites. Very little persuasion or encouragement on the part of the District Officer will be necessary to induce the people to congregate at these central points, and it will be no matter of regret that one healthy and well-peopled village should supersede half a dozen wretched, fever-stricken hamlets.

These hamlets consist of a few huts, formed of materials found on the spot, and the people, from the prevailing fever, are constantly migrating from one site to another.

It is by no means necessary for the due cultivation of the district that all these hamlets should be inhabited: if the sites for wells were judiciously chosen, there villages would be built, and from thence, as from a common centre, the neighbouring lands would be cultivated, and the less favoured sites would become (as it is desirable they should be) abandoned altogether as dwelling-places. The material for building is procurable everywhere in the jungle; the measure involves no loss or hardship to the people in the abandonment of houses, nor outlay to Government beyond the first cost of the well.

In conclusion, I would only further remark that wells, whether in the jungle or the plain, require care,—they are sometimes altogether neglected: mud and refuse accumulate (washed into the well when the parapet wall is imperfect); overshadowed by trees; quantities of leaves fall into the well; noxious plants are allowed to grow round the sides of the well; and it is especially deserving of notice that both the roots and leaves of many of these plants which love the water *are poisonous.*

I have remarked in particular the *Lobelia nicotianæ foliæ* and the Boke (recognised by botanists as the *Microcillus,* which belongs to the *Euphorbiaceæ*)—and both are poisonous in a high degree; there are, no doubt, many others.

* The Kukery Keriat, under Belgaum.

I would beg to recommend that the Collectors should order an annual return from all their Mamlutdars, certifying—

1*st*.—That all the wells in the month of May, or before the 6th June, where the water is lowest, have been cleaned out; and all plants, of whatsoever kind, growing in or near the well, removed.

2*nd*.—That all trees growing over or near the well have been cut down, with the single exception of the Banyan tree. This should be exempt, not only in deference to the superstition of the people, but also from its innoxious character, and on account of the comfort its shade affords to travellers. The branches which actually drop over the well ought to be removed. The Mamlutdar should direct this annual cleaning of the well, and removal of rubbish, by the villagers; and as it is done for their own special benefit, it should involve no expense to Government.

These remarks may appear trivial; and it may be supposed that, if really needed, their own interest and advantage would have taught the Natives to take these simple precautions without order. But experience proves that neither the people, nor the heads of villages, nor the heads of districts, will trouble themselves about such matters, *unless compelled thereto by standing orders, rigidly enforced, under the personal supervision of European Officers in their tours through the country.* The attending to or neglecting these apparently unimportant details often constitute the difference between healthy and unhealthy villages, especially in the jungles.

A. Bettington.

MINUTE BY THE RIGHT HONORABLE THE GOVERNOR, CONCURRED IN BY THE HONORABLE MESSRS. WARDEN AND LUMSDEN.

Dated 25th August 1854.

The above Memorandum has been furnished to me by Mr. Bettington. I wish for the opinion of the Medical Board, Conservator of Forests, and several Collectors, on the suggestions contained therein, and that the Collector of Belgaum should be applied to for information as to the result of the measures formerly taken by Mr. Bettington.

(Signed) Elphinstone.
J. Warden.
J. G. Lumsden.

25*th August* 1854.

No. 2107 of 1854.

To the Secretary to Government, Territorial Department, Revenue.

Sir,—With reference to your Endorsement No. 4229, of 13th instant, I am directed to state, for the information of the Right Honorable the Governor in Council, that in the opinion of the Medical Board, the suggestions contained in Mr. Bettington's paper deserve much attention. It is, they believe, unquestionable that decomposing organic matter, in suspension or solution, is found in the water of rivers, brooks, and nullas, in greater or less proportion.

2. Ordinarily, the quantity may be insufficient to act injuriously; but it cannot be doubted that water strongly impregnated with it is deleterious.

3. The Board could refer to recent instances (not in jungly districts, however) in which such impure water induced serious disease in bodies of men (fever and bowel complaints), which was at once checked by water being procured from purer sources.

4. It corroborates Mr. Bettington's opinion, too, that the Natives in jungly districts in Khandeish formerly (and possibly now) attributed these fevers and enlarged spleens to the bad water of their districts.

5. The Board cannot venture to affirm that "the water of jungle districts is the chief cause of the fevers which prevail in those districts"; or that "the health of the population of jungle districts is more affected by the bad water which they drink throughout the year, than by the malaria, which, however deadly, is only in operation for a very limited period"; but they think that the measure proposed by Mr. Bettington is deserving of attention, and, if carried out, that it will be productive of benefit.

6. Individually, no Member of the Board has lived much of a jungle life; and therefore, if the reference to the Conservator of Forests, and other Officers who have been much in jungles, has not been made, the Board would respectfully submit that it should be attended to, since they are disposed to think that their opinions may be found to be much in unison with those of Mr. Bettington.

I have the honour to be, &c.

(Signed) F. Manisty, Assist. Surgeon,
Secretary, Medical Board.

Bombay, Medical Board Office, 18th September 1854.

No. 1070 of 1854.

From the Conservator of Forests,

To the Secretary to Government, Revenue Department.

Camp Calicut, 20th November 1854.

Sir,—In replying to the subject of the reference made under date 13th September, No. 4230, regarding the comparative effects of spring and

stagnant water in forest districts, I have the honour to state my opinion, that from what I have seen, I may say that there is considerable foundation for the view taken by Mr. Bettington.

2. Thus the dwellers in Kolwan, and other parts of the northern part of the Tanna Zillah, mostly use the water procured from wells, and it is well known that these people are not peculiarly unhealthy, but rather the contrary, though they mostly inhabit valleys clothed with thick jungle.

3. So also in Alibagh, where there is much forest, but wells are numerous, sickness from malaria is not very common. The contrary is the case in the adjacent territory of the Hubshee; and it might be of interest to ascertain whether the people there drink well or stream water.

4. Again, many of the villages south-east of Ahmednuggur, and situated in the valleys opening on the Bheema, are very unhealthy, enlarged spleen being a most common disease. In these, the people almost always drink the water of the streams, which water is strongly impregnated with lime. There is no jungle whatever about these villages, but only stony, semi-barren plains. Further, I note that in many villages along the Kookree, and other rivers of the Joonere district, albeit situated in bare black plains, enlarged spleen, and malarious fever consequent thereon, are very prevalent complaints; but I do not observe any tendency to these affections in adjacent villages or towns where well or fountain water are consumed. In proof of the latter fact I can instance Dungurwaree, and other places where I have an opportunity of intimately knowing the state of health of the inhabitants.

5. There are, again, other places, such as the Dangs of Surat, and some of the valleys of Baglan, where no amount of well-water will suffice to neutralize the malaria incident to the locality; but the principle is one which should, I think, be kept in view, and applied, when practicable, in places where the malaria or malarious water is so hurtful as seriously to affect the population rate of the village.

6. In many cases, sanitary arrangements, involving a change of water, will be found to be most difficult in carrying out, from the indisposition of the people themselves to change so convenient a source of supply as that from a river. This I take to have been one cause of the utter failure of the attempt to transplant the village of Baz in Baglan from its present locality (notoriously one of the most unhealthy even in Baglan) to a more elevated sloping ground, having a supply of water from wells. I believe that the same passive resistance would be found to take place in many other places where Government might wish to interfere in changing the source of water supply.

I have the honour to be, &c.

(Signed) Alex. Gibson,
Conservator of Forests.

No. 3836 of 1854.

Territorial Department, Revenue.

Poona, Revenue Commissioner's Office, 7th December 1854.

In reply to the Government Memorandum No. 4233, of the 13th September last, the Acting Revenue Commissioner Southern Division has the honour to report as follows.

2. The opinions of the Collectors have been obtained, and are submitted for the consideration of Government in the following summary:—

3. "The Collector of Poona (Mr. Jones) has no hesitation in stating that Mr. Bettington's suggestion is an excellent one."

4. The Acting Collector of Ahmednuggur (Mr. Bell) is of opinion that the most practicable mode of effecting the object aimed at by Mr. Bettington will be found to be a notification to the inhabitants of each village, explaining to them the noxious effects of drinking bad water, and the advantages obtainable, at the cost of a little trouble, by keeping wells in a state of cleanliness, removing trees, vegetation, and rubbish of all kinds.

5. Mr. Bell thinks that the village and District Officers should be made to see to the cleanliness of the wells used for drinking.

6. He would further require Assistant Collectors to visit the village wells.

7. Mr. Bell observes that it is not clear in what manner, or by what agency, the orders proposed by Mr. Bettington can be enforced, if coercive measures are intended for the purpose of procuring compliance with them. There are, he adds, no individuals who can be charged with the duty of cleaning wells, nor any law by which they can be held directly and generally responsible for inattention to any orders which may be issued.

8. The Collector of Sholapore (Mr. Loughnan) states that two of his districts, Indee and Hypurga, are annually afflicted with fever, cholera, and failure of crops, because the monsoon supply of water is not preserved by a system of dams. The scarcity of trees, and elevated nature of the country, prevent much of the water being retained. What is retained is liable to all the objections represented by Mr. Bettington. The cleansing of wells, he remarks, is much neglected; but how to enforce it, without the aid of legislation, he finds it difficult to suggest, *since* every effort for the general introduction of the Municipal Act has proved vain.

9. Mr. Loughnan thinks it right that the people should bear the expense of providing drinking water for themselves.

10. As the rays of the sun decompose water, and the air causes evaporation, and the high winds convey injurious matter to the water, however carefully vegetation may be cleared away from the open mouth of a well, he would propose the construction of *long* wells, with so small a width as to enable each to be vaulted or arched over the whole length, with little additional expense. He would not allow steps to the water's edge, but have the water

drawn up from a parapet. This would prevent bathing, washing clothes, and copper pots.

11. Finally, Mr. Loughnan recommends the adoption of Mr. Bettington's suggestions.

12. The Collector of Dharwar (Mr. Rose) concurs in the opinion of the Acting Collector of Ahmednuggur. He objects to Mr. Loughnan's *long* wells, without steps, that the benefit of them would be very much confined to those who can afford to pay servants to draw water for them, and be lost in a great measure to those who have to depend on themselves or the women of their household.

13. The Acting Collector of Belgaum (Mr. Havelock) is of opinion that although disorders of the liver and spleen, and severe epidemics, may often be traced to the use of bad water, it is not established that a supply of pure well-water, where such disorders prevail, would prevent them. He also expresses a doubt as to whether good well-water could always be found in localities where that procured at present from tanks, streams, or pools is deleterious.

14. As a rule, however, Mr. Havelock assumes that the water of a well in *constant use* is wholesome. Stagnation is to be guarded against. He adduces an instance in Khandeish, of stagnant water being rendered wholesome by use.

15. Mr. Havelock adduces another instance, also in Khandeish, of running water being considered more actively injurious than miasma, which prevails at Nowapoor all the year round. The water of this stream, during the unhealthy months, has a peculiar appearance and taste, cognizable by any one, and becomes in March, April, and May, both palatable and wholesome: but strange to say, a well in constant use in the same locality has the same peculiar disagreeable taint, and is equally unwholesome with the water in the stream.

16. With respect to the wells mentioned by Mr. Bettington as having been constructed by him when Assistant Collector of Belgaum, Mr. Havelock finds, upon inquiry, that the wells at Jambotee and Tullywaree are salubrious, and that much benefit has been derived from them.

17. The spring at Teerutkoondee is said to be not in general use, owing to its distance from the village.

18. The water at Chandghur is on all hands allowed to be good; but general opinion does not seem to hold Chandghur more healthy than other villages in the same line of the Ghauts.

19. Mr. Havelock suggests that the leaves which fall into a well in constant use do not affect the salubrity of the water: for instance, the water of a garden well, worked for irrigation, is generally pure and wholesome, notwithstanding the quantity of leaves often found in it. Mud accumulated at the bottom of a well can be removed at intervals, as occasion requires; leaves also can be removed at once if necessary.

20. Mr. Havelock expresses himself desirous of securing to the people a supply of good water, but averse from laying down strict rules for the observance of village and District Officers, which cannot be carried out.

21. The Collector of Rutnagherry (Mr. Spooner) concurs in the opinion expressed by the Acting Collector of Ahmednuggur, and has no remarks of his own to offer.

22. It will thus be seen that the wells dug by Mr. Bettington have effected good; also that the Collectors of this division admit the propriety of procuring for the different communities under their charge a supply of wholesome water, wherever it may be wanting or practicable. The propriety of preserving the water used for drinking in a wholesome state is also admitted; but there is a question as to the means of enforcing cleanliness.

23. The Acting Revenue Commissioner is very much of Mr. Havelock's opinion, that as long as wells are in constant use, the water which they contain is, as a general rule, wholesome. He would not lose sight of the fact that minerals must and do operate powerfully in determining the properties of water; and he is convinced that Natives are excellent judges of water; and that if it can be had good, they will instinctively avoid that which is bad.

24. Existing rules (Government orders, dated 4th September 1835) appear sufficient to enable Collectors to procure the construction of wells wherever they may be wanted. If the inhabitants of a village require a well, the Collectors and their Assistants have it in their power to advance a sum of money, which will in some cases cover the whole, and in others a considerable portion, of the necessary expense. In surveyed districts especially, the villagers cannot be at any loss to supply themselves with good water where it is obtainable.

25. Of the villages mentioned by Mr. Bettington, the Acting Revenue Commissioner knows that Jambotee, Chandghur, Tullywaree, and Hemadgee, are still very feverish, and that cholera is as frequent in them as in the surrounding localities. At the same time, he fully admits that the wells dug by that gentleman have effected great benefit. In point of fact, he believes that in a very damp region, like that of the Western Ghauts, spleen and fever cannot be effectually combated, except by warm, substantial houses, and warm clothing. Change of site may possibly be advisable in some very few intances, but that alone would never be sufficient. The sites of villages have generally been judiciously taken up by the Natives of this country, and great difficulty would be found in procuring any change, even if such were found advisable. Circumstances, however, may certainly occur, in which a change of site may be advisable and practicable; and of these the Collectors will doubtless take due notice.

26. It must, however, be admitted that village wells, used for drinking water, ought to be carefully kept from impurity, whether arising from bathing the person, washing clothes, vessels, or noxious matter, vegetable or otherwise. The only question is whether the Collector, as Magistrate, has by law the power of enforcing public cleanliness in this respect. Mr. Bell, the Acting Collector of Ahmednuggur, having proposed the issue of a notification for the promotion of the object in view, the Acting Revenue

Commissioner applied to him for his opinion whether Regulation XII. Section XIX. of 1827, and Act XXI. of 1841, do not enpower a Magistrate to enforce the removal from a tank, well, or pool, of any noxious and offensive matter. Mr. Bell's reply is, that although the enactments referred to would justify the infliction of a fine upon any individual who might place offensive matter in a public well, they do not apply to the nuisances created by the operation of natural causes; and there is no person upon whom rests the legal responsibility of counteracting the effects of such causes.

27. It appears evident, however, that a Magistrate can, under the above laws, prevent washing and bathing at certain public wells, used for drinking water, and at certain spots in rivers and tanks ; and this he ought to do.

28. And the Acting Revenue Commissioner is of opinion that the same authority (Section II. Act XXI. of 1841) which enables a Magistrate to compel a community to fence a well or tank, to prevent danger arising therefrom, ought to empower him to remove rubbish, and mud, and vegetable matter from them, with the same object.

29. Wherever Act XXVI. of 1850 is in force, no difficulty whatever will be felt in promoting the object aimed at by Mr. Bettington.

30. The Acting Revenue Commissioner considers that a notification of the kind proposed by Mr. Bell would be beneficial only if a Collector can enforce its provisions; and under the opinion which he holds, he would have no hesitation in issuing one of a somewhat more stringent nature, and resembling that suggested by Mr. Bettington.

(Signed) H. W. Reeves,
Acting Revenue Commissioner, S. D.

No. 203 of 1855.

Territorial Department, Revenue.

MEMORANDUM.

In reply to the Government Memorandum No. 4231, of 13th September 1854, transmitting a copy of a Memorandum by Mr. Bettington, on the subject of the Water in Jungle Districts being the chief cause of fever in those districts, for opinion and report, the Collector of Sattara has the honour of stating that, while Collector of Dharwar, he submitted his opinion and report on this subject, and that he has nothing now to add to that report.

(Signed) J. N. Rose,
Collector.

Sattara Collector's Office, Camp Poosasowlee, 22nd March 1855.

No. 2583 of 1855.

Territorial Department, Revenue.

Revenue Commissioner's Office, Poona, 19th July 1855.

In reply to the above,* the Revenue Commissioner begs to lay before Government the reports of the Collectors of this Division, as per margin. It will be observed that none of the Collectors fully subscribe to the opinion of Mr. Bettington, that bad water is the only or principal cause of the prevalence of fever in jungle districts. The instances adduced to the contrary by the Collector of Khandeish are very strongly in point. Bad water, however, will undoubtedly produce a diseased state of the body, which must necessarily tend to make fever, when it supervenes, more malignant and fatal.

Ahmedabad.—No. 644, dated 11th November 1854.
Kaira.—No. 482, dated 29th December 1854.
Broach.—No. 40, dated 17th January 1855.
Surat.—No. 377, dated 26th May 1855.
Tanna.—No. 850, dated 25th April 1855.
Khandeish.—No. 1154, dated 12th July 1855.

2. The measures proposed by Mr. Bettington would, the Revenue Commissioner thinks, be beneficial in many localities; but he would suggest that the opinion of the Medical Board be taken on the subject.

(Signed) E. G. Fawcett,
Revenue Commissioner, N. D.

No. 644 of 1854.

Ahmedabad, Collector's Office, 11th November 1854.

In reply to the above, the Acting Collector of Ahmedabad has the honour to report that he has received replies from the officers named in the margin, to whom references were made, requesting their opinion whether the fevers that annually prevail in certain localities in the districts of this Collectorate with which they are acquainted are attributable to the impure and unwholesome water from tanks and wells, or to malaria and other causes; and if so, to state their views as to the suggestion offered by Mr. Bettington.

Mr. Ritchie, Acting First Assistant; Mr. Ravenscroft, Acting Second Assistant; Mr. Jordan, Hoozoor Deputy Collector; and Dr. Larkins, Civil Surgeon.

2. Mr. Ritchie, Acting First Assistant, states that he has instituted inquiries, and is inclined to doubt the applicability of Mr. Bettington's views

* Government Reference No. 4232, dated the 13th September 1854, forwarding a copy of Mr. Bettington's Memorandum for the opinion of the Collectors of the Northern Division, on the suggestions therein contained.

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of the sources of jungle fever to the districts under his charge: that fever is only found to prevail in certain localities, from about the period of the closing of the monsoon to the setting in of the cold season; that the tanks generally contain little else than rain-water, and that, with the exception of the larger rivers, all streams dry up in the hot weather; that there are no forests in the districts under his charge, and that the wells are for the most part in open ground, away from trees, &c.

3. Mr. Ritchie would therefore ascribe the prevalence of fever rather to malaria arising from the rank and luxuriant vegetation that springs up during the rains, and reaches maturity during the period that intervenes between the closing of the monsoon and the setting in of the cold season; and observes that it is a well known fact that Europeans, who may be necessitated to travel during the season he refers to, through some parts of the country, are almost invariably attacked with fever, though they may not drink at all of the water, or confine themselves to the use of the purest spring-water.

4. Mr. Ravenscroft, Acting Second Assistant, in charge of Duskrohie and Jeytulpoor, states that from inquiries he has instituted he learns that the general impression is, that fever is caused by miasma and corrupting vegetation, and not by badness of water.

5. Mr. Jordan, Hoozoor Deputy Collector, who is well acquainted with this and other parts of Guzerat, would attribute the prevalence of fevers to the decomposition of vegetation in the months of September and October, when the night dews are heavy, and the sun, during the mornings, very penetrating. He considers that Mr. Bettington's remarks are more applicable to the Attaveesee District of the Surat Collectorate, where streams flowing from the mountains and forests in the interior are met with, and the supposed aborigines of the country, and the poorer classes, have an emaciated appearance, which he was informed was the effect produced by the endemic influence of the water in these streams, &c., of which the people are in the habit of drinking.

6. The fevers that prevail in the villages along the banks of the Kharee Mr. Jordan thinks is caused by the large pools of stagnant water which are kept for purposes of irrigation while the rice crops are on the ground, and afterwards for the cattle, when the stream of the Kharee river stops flowing; the decomposition of the weeds, creepers, and aquatic plants growing therein engenders malaria, and in this way fever is caused.

7. Dr. Larkins, Civil Surgeon, states that, after nine years' experience in Guzerat, he has seen nothing that could satisfy his mind that bad water is the cause of the disease; that he believes that it arises from no single cause; and that while content to attribute it to the somewhat vague term of malaria, we have omitted to take into account certain electrical conditions of atmosphere, as vicissitude of temperature, and the sudden setting in and prevalence of particular winds,—exposure to the direct rays of the sun being often a potent cause of fever.

8. To the above, the Acting Collector has only to add that he concurs generally in the opinions and observations above noticed, as regards the endemic causes of fever in this part of the province; while at the same time he considers that the suggestions offered by Mr. Bettington, though not generally applicable to the districts of this Collectorate, might be adopted and acted upon with advantage in a sanitary point of view, wherever the water in wells and tanks may be considered unwholesome, and found on inquiry to be in the state described by Mr. Bettington.

(Signed) J. W. HADOW,
Acting Collector.

No. 482 OF 1854.

TERRITORIAL DEPARTMENT, REVENUE.

Kaira Collector's Camp, Neriad, 29th December 1854.

The question submitted for opinion is one upon which physicians are the most competent to advise: at the same time, it cannot be doubted that the greater prevalence and severity of jungle fever, in tracts of dense forests, and on the borders thereof, may be attributed both to the corruption of the air and water, by the presence of an excess of vegetable matter undergoing decomposition in these elements, producing carbonic acid gas; and whether this be inhaled by the lungs, or taken into the system when water is drank, the effect is the same,—either cause will produce fever.

2. Instead of drinking such water found on the surface, if it be filtered through the soil till collected in wells, as Mr. Bettington proposes (by which the grosser particles of vegetable matter may be excluded), some mitigation of the evil (the liability to fever) may be obtained; but the filtering process will not cause a chemical change in the constituent portions of the water.

3. Colonel Outram, I am told, used to take pure water with him when he conducted military expeditions into the Dang forests of Khandeish, to coerce predatory or turbulent Bheel tribes; but it did not prevent those who drank it from catching jungle fever.

4. Opening and ventilating jungles, the removal of vegetable matter in excess, from land or water, can alone restore the salubrity of a district: the Collector is therefore of opinion that the building of wells, as suggested by Mr. Bettington, may have a mitigating effect, but, generally, is not sufficient of itself to avert or remove fever produced by combined causes.

(Signed) ALEX. ELPHINSTON,
Collector.

No. 40 of 1855.

Broach Collector's Office, Camp Ahmode, 17th January 1855.

The Collector of Broach has the honour to state that there are no dense jungles in the Zillah of which he has charge, and the months in which fever for the most part prevails are those of Baderwa and Asho (September and October), when it is not very likely that the disease is occasioned by the badness of the water alone.

With reference to the remark made in the 3rd paragraph of the Report of the Collector of Kaira, the Collector of Broach thinks it as well to mention that he happened to have a conversation with Colonel Outram on the subject of the fever which is contracted in the Dang jungles of Khandeish, a few months ago, and Colonel Outram then expressed an opinion that the said fever is caused by some kind of poison which is *inhaled* into the stomach, and which almost invariably takes effect in about fourteen days after it is so inhaled. Colonel Outram also expressed an opinion that the danger might be avoided by using a covering for the mouth; and the Collector thinks that he understood Colonel Outram to say that he himself escaped the fever by that means, while all the other officers who accompanied him, and who failed to use any precautionary measures, were attacked with it.

In conclusion, however, the Collector of Broach begs respectfully to state that he thinks it extremely probable that Mr. Bettington is right, and that there may be many places in the Southern Mahratta Country, and elsewhere, in which the endemic fevers may be attributable, either partly or entirely, to the water having been corrupted in the manner described by him; and where this is supposed to be the case, the Collector thinks that there is no doubt that the suggestions offered by Mr. Bettington may be acted upon with the greatest advantage.

(Signed) E. L. Jenkins,
Collector.

No. 377 of 1855.

Territorial Department, Revenue.

From H. Liddell, Esq., Collector of Surat,

To E. G. Fawcett, Esq., Revenue Commissioner, N. D., Poona.

Surat Collector's Camp, Teethul, Bulsar District, 26th May 1855.

Sir,—With reference to your Circular Memorandum No. 2257, dated the 16th September last, with accompaniments, relative to water in jungle districts,

I have the honour to report that the only Talookas where dense jungles actually exist in this Collectorate are six, viz. Mandvee, Koorsud, Walore, Chiklee, Bugwara, and Parnera. The people residing in these jungles, and on their borders, suffer generally from fever and other diseases, which are partially attributed to the water becoming bad by plants, leaves of trees, and other vegetable substances undergoing decomposition in it. I am not, however, prepared to admit that the use of bad water is the only cause of the unhealthiness of a district: there are other more weighty causes which tend to produce the evil, such as the well known malaria which always exists in the neighbourhood of dense jungles.

2. I however consider Mr. Bettington's suggestions as to the clearing of the old and neglected wells of the jungles, and constructing new ones in well selected places, on the plain, to be sound and judicious, as tending in no small degree to the healthiness of the districts.

3. I would therefore beg to propose that I may be permitted to cut down all trees, plants, &c. which have grown on or near the parapets of wells and tanks, on the banks of streams and nullas, and also to take out mud and rubbish which may have accumulated there, the waters of which are used by the inhabitants of any of the abovementioned six districts. Should this plan be once adopted, and the Mamlutdars be then strictly ordered to cause all plants which may subsequently grow therein to be cut down annually, and to furnish returns of the nature indicated by Mr. Bettington every year before the setting in of the monsoon, I anticipate that some change for the better will take place in the health of these districts.

4. In conclusion I beg to suggest, that as Dr. Gibson is well acquainted with the Dang and other jungles bordering on this Collectorate, and being, moreover, a medical man, that he be called upon for his opinion on this subject.

I have the honour to be, &c.

(Signed) H. LIDDELL,
Collector.

No. 850 OF 1855.

REPORT OF THE COLLECTOR OF TANNA.

Tanna Collector's Office, 25th April 1855.

I have the honour to observe that the facts stated by Mr. Bettington of the good effects of digging wells, and thus obtaining a supply of spring-water, show indisputably that in some localities fever can be averted by these means.

2. There would seem, however, to be very good reason for doubting whether in most places the water is the principal cause, or even one of the

causes, productive of endemic illness. In many jungle districts, fever is neither prevalent, nor even very common, from February to August, and during a great part of this period the water is worse in quality than at any other time of the year. In some of the most unhealthy districts, the inhabitants drink nothing but river-water, and if using it were the cause of fever, all the villages on its banks would suffer equally; but such is not the case: in some villages, for instance in the open plains of the Nerbudda and Taptee Valleys, fever is never particularly prevalent, whilst in other villages in jungly parts of the same river, I have known half the inhabitants ill with fever at the same time.

3. With respect to the closing paragraphs of Mr. Bettington's Report, I have the honour to observe that I have over and over again been unable to persuade villagers to undertake any trouble or expense in cleaning out their own tanks and wells. I agree entirely with Mr. Bettington, that very frequently neither the people nor the heads of villages will trouble themselves about such matters, *unless compelled thereto;* but the Collector and Magistrate has no power of compelling them to work, even for their own advantage.

(Signed) G. B. Seton Karr,
Collector.

No. 1154 of 1855.

From S. Mansfield, Esq., Collector of Khandeish,

To E. G. Fawcett, Esq., Revenue Commissioner, N. D., Poona.

Khandeish Collector's Office, Dhoolia, 12th July 1855.

Sir,—I do myself the honour to acknowledge the receipt of your Circular Memorandum No. 2257, dated 16th September 1854, forwarding a Memorandum from Mr. Bettington on the subject of water in the jungles producing fever and sickness, and suggesting certain precautionary measures.

2. I circulated a translation of Mr. Bettington's Memorandum to the Deputy Collectors in Khandeish for their opinion, and they generally concurred in the views of that gentleman, that bad water in the jungles is one of the chief causes of sickness and fever. The question is one I feel little competent to give an opinion on; but as far as my experience goes, I should say, that though to drink bad water filled with vegetable deposits must be extremely injurious in its consequences, and must contribute to the general unhealthiness of a district, yet it is not the principal cause, nor would the salubrity of a locality, in the majority of instances, be much improved if good water were substituted.

3. Certain portions of the Baglan, Pimpulnair, Nundoorbar, and Sooltanpoor Talookas are extremely unhealthy, and in certain seasons are not only

fatal to Europeans, but to Natives of other parts of Khandeish. These districts are generally waste, or covered with jungle: out of the whole arable land, not more than ten or twelve per cent. is under cultivation. Nowapoor, the station of the Mahalkuree of the Pimpulnair Talooka, is the most deadly climate. It is situated not very far from the top of the Western Ghauts, and the district for the most part is covered with jungle. A river flows by the town, and the water is considered to be particularly bad, and impregnated with vegetable deposits, and the inhabitants have sunk several wells, the water of which they exclusively drink. The health of the community is, however, very bad, and the people suffer dreadfully from fever and spleen;—a very few individuals reach an advanced age. There is a Mahalkuree's Kutcherry at Nowapoor, and all the Government servants belonging to it use the well-water, but still they fall sick after a few months, and, if not removed, contract the seeds of disease, which sooner or later carries them to the grave.

4. The town of Pimpulnair is, next to Nowapoor, the most unhealthy locality in which there is a district Kutcherry; but it possesses most excellent spring-water, which has a good reputation all over Khandeish. The general Native opinion is that a district is healthy or otherwise according as it is waste or cultivated; and in support of this, numerous instances are cited by them, which show that the salubrity of tracts of country has improved as cultivation has extended, and *vice versâ*.

5. People who can recollect the Dhoolia Talooka forty years ago, say that it was then as unhealthy as Baglan; and now, though not an agreeable climate, it is just as healthy as the best parts of Khandeish; and there is no doubt the climate of the whole province has very much improved, while, in some few cases, districts which were formerly highly cultivated, and supported large populations, have gradually become waste, and deteriorated very much in climate.

6. I may mention the instance of Pankheira, formerly a very populous Kusba, with thirteen Paras or hamlets, and now there are only half a dozen inhabitants left: this town was considered formerly as healthy as any other part of the district, and now it is quite the reverse.

7. In Khandeish there are whole districts, as the Pal Tuppa, Doula Turuf, Amba Purgunna, &c. entirely waste. The remains of temples, wells, and mango topes, prove that at one time they supported a dense population; and now the climate is so deadly that nobody can live in them but a few Bheels. Several efforts have been made by the local authorities to induce people to settle in them by advances of Tuggai, and grants of land free of assessment for twenty years; but all such efforts have resulted in failure, owing to the havock made by the climate, which, after destroying the larger number of those who had been tempted to settle in them, compelled the remainder to abandon them altogether.

8. After an attentive consideration of what I have been able to ascertain

regarding the past and present climate of Khandeish, and other Collectorates of the Bombay Presidency in which I have served, I am inclined to think that if a district is waste, and covered with jungle, nothing but removing the jungle, and bringing the land under cultivation, will improve the climate; and should the water of its rivers and nullas be impregnated with vegetable deposits, and, consequently, deleterious to the health of the inhabitants, and good water be supplied from wells, no sensible improvement in the general health of the community would be observable as long as the whole country was infected with malaria, produced by decayed vegetation; and the correctness of this opinion is confirmed by the fact of no country which is in a high state of cultivation being considered by the Natives unhealthy, though there may be many localities in them where the reputation of the water is far from good.

9. There may be exceptional cases, in which the unhealthiness of the locality is entirely owing to the water; and Kookurmoonda, in the Sooltanpoor Talooka of this Zillah, is a case in point. The unhealthiness of that town is ascribed by the inhabitants to their being compelled during the rains to drink the water of a nulla, which takes its rise in the Satpoora Hills, and is filled with vegetable deposit. This was reported to you in my letter No. 2048, dated 9th December 1854, and on my recommendation the Kutcherry was removed to Taloda.

10. I cannot, therefore, concur in Mr. Bettington's opinion, that bad water is the principal cause of the unhealthiness of certain districts, and that if fine water was supplied, unhealthiness would cease to exist.

I have the honour to be, &c.

(Signed) S. MANSFIELD,
Collector.

LIBRARY OF THE BOMBAY BRANCH OF THE ROYAL ASIATIC SOCIETY

No. 3889 of 1855.

Territorial Department, Revenue.

Copy of the Resolution passed by Government under date* 14*th September* 1855, *on the papers noted in the margin, being Reports relative to a representation made by Mr. Bettington of the evil effects produced on the Health of the Population of Jungle Districts, by the bad Water which they drink, and to the measures suggested by that Officer with a view of securing to Villages a supply of pure Well-water.*

Letter from Secretary to the Medical Board, No. 2107, *dated the* 18*th September* 1854.
Letter from the Conservator of Forests, No. 1070, *dated the* 20*th November* 1854.
Memorandum from the Acting Revenue Commissioner S. D., No. 3836, *dated the* 7*th December* 1854.
Memorandum from the Collector of Sattara, No. 203, *dated the* 22*nd March* 1855.
Memorandum from the Revenue Commissioner, N. D., No. 2583, *dated the* 19*th July* 1855, *with accompaniments.*

From the information now before Government, there would appear to be ample ground for the opinion that the use of water impregnated with decayed vegetable matter has a very prejudicial effect on the health.

2. The Revenue Commissioners Northern Division and Southern Division may be instructed to direct the Collectors in their several charges to issue orders to their subordinate officers to institute inquiries as to villages, more especially in Jungly Districts, dependent on streams or tanks for drinking water, with the view of supplying, when practicable, the want of pure well-water at such villages.

3. With reference to Mr. Bettington's suggestions, at the end of his Memorandum, His Lordship in Council is of opinion that it will be sufficient to direct the wells to be cleared out before the monsoon, leaving it to the discretion of the local officers to remove any rank vegetation around them, which is likely to affect the purity of the water they contain.

(Signed) H. Young,
Officiating Chief Secretary to Government.

* Communicated to the two Revenue Commissioners, as also to the Conservator of Forests, Medical Board, and Mr. Bettington.

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